Mr. Chairman, Honorable Senators, Members of the Staff and other interested parties.

My name is Ralph Hutcheson, President and CEO of Scientific Materials Corporation, Bozeman, Montana. It is my honor and privilege to address this committee on the emerging technology of the new millennium. I feel qualified to do that as Scientific Materials is involved in many of these technologies including new medical procedures, optical protection, high power lasers, remote sensing, telecommunications, lithography, direct power generation, optical memories, high speed data processing, laser machining to name a few. Our entire focus is the development and manufacture of high perfection crystalline optical components such as laser rods.

There are two subjects I would like to present to the committee which I consider of utmost importance. One is the degradation of long term research in this country. It is a total fallacy-if the industrial leaders of this country think they can maintain leadership without the continuous flow of new concepts. In the written text there are nine emerging technologies in which Scientific Materials is playing a major role. All of these programs resulted from a 1990 SBIR program. The time span has been eight years to bring the programs to the device concept stage and it will be another one to twelve years to bring the devices to application.

We have allowed the rapid developments in the telecom industry to over shadow our historical lessons. The telecom developments are the result of eighty years of research. Many of the concepts are the results of research in the 1940's and 50's. It has taken forty years to develop the infrastructure to evolve these concepts into useable systems. There are finite limits to how far these technologies can be expanded. New research must be employed to provide new technologies before the limits of the old technology are reached. By working the Government Labs and National Labs, Scientific Materials is trying to aid in accomplishing this goal.

The second item is the need to increase industry - university involvement. Ten years ago Scientific Materials started a program with Montana State University. Today that program has evolved into thirty five researchers, graduate students, post doc's and undergraduates. The program has allowed Scientific Materials to do things previously not possible and at the same time broaden the horizons of the university people to world renown stature and we have not interfered with academic freedom. This work needs to be expanded and perhaps provides a partial solution to the long term research needs. Universities can not do it alone.

In closing, I also ask the committee to support the renewal of the SBIR program. It is my hope Scientific Materials demonstrates the validity of this program to the long term viability of the United States of America.

Thank you very much for this opportunity.

EMERGING TECHNOLOGY OF THE NEW MILLENIUM

BY

RALPH L. HUTCHESON
PRESIDENT
SCIENTIFIC MATERIALS CORPORATION
BOZEMAN, MT

SUMMARY:
Scientific Materials Corporation is a lead organization in the development of new and improved crystalline materials for emerging technologies in opto-electronics. Applications cover a broad scope of industries including medicine, materials processing, telecommunicatiions, data processing, power generation, weaponry, space communication, remote sensing and others.

In its' work, Scientific Materials has found most new applications require a long time period to bring to flourishion. It is a current trend in American industry to forego long term research which disallows the natural product development process. It also decreases the evolvement of infrastructure to allow creation of future new products.

Scientific Materials has worked with Montana State University for ten years to develop a working method with the university that enhances academic freedom and enriches researchers field of study. With closer industry - university ties and improved researcher productivity, a portion of the void created by reduced long term industrial research may be filled.

DISCUSSION:

It has been said that the 1900's was the century of physics and the 2000's will be the century of bio-physics. The physicists are taking a great deal of credit and may have some justification as they are almost at the point where they can mathematically analyze living organisms. All they need is a few orders of magnitude advancement in data processing. In the mid 1980's, I recognized the need for better materials. If the need requires six orders of magnitude increase in processing speed, the material requirements increase by eight orders of magnitude. At that time, no one believed this, hence I founded Scientific Materials Corporation. The company has grown, via back pocket funding and the SBIR programs, to be a leader in materials development for opto-electronic applications. Appendix A is a listing of applications in which Scientific Materials Corporation is playing a major role in materials development. To quote one major researcher in a national laboratory, "We could not be doing this today if you had not had the foresight to work on improved materials when you did".

It should also be noted to this committee that the work done by Scientific Materials could not have been accomplished in a large organization because modern management could not be educated to see the benefits. I have interviewed several candidates for management level jobs and the common characteristic of these candidates is they can only see a narrow single product focus. It is this thinking that has dramatically reduced industrial long term research in the country. There is an ever increasing need to broaden our base knowledge, particularly in industry, not shrink it. Scientific Materials is a highly focused organization, but it is focused on what we do and how to do it better. This broadens our application base and allows us to continue to improve product performance.

At the inception of Scientific Materials, I recognized that it would be impossible to do the job I envisioned for Scientific Materials without help. We have seven key technologies which require individual expertise. We have in our community a university which has most of the required expertise but we had no known way to tap that knowledge on a continuing bases. University researchers are at these institutions to perform research in

"their" field of study but not in a directed program. What we discovered is that by allowing the university researcher to see our need he could fit that need into his research with no impediments by the outside firm. Not only is there no interference with "academic freedom" but rather there is enhancement and in most cases a large enrichment in the field of study. Using the MSU prototype, Scientific Materials is expanding its university program to other institutions including Stanford, MIT and Cal Tech. We also are working in a similar manner with both US Government and National Labs with considerable success.

It is my opinion that universities alone can not fill the long term research gap. It is possible however, by closely tying together industrial and university activities, to greatly enhance the effectiveness of the research programs thereby filling the void created by shortsighted industrial management.

I strongly urge this committee to consider legislation which can enhance university - industrial relations, not to weaken the education process, but to make marked improvements in the productivity of one of America's greatest resources. We know it can be done because we have proven it.

I can not leave without asking the support of this of this committee for the SBIR program. There are many jobs that can best be done by small business. I believe the SBIR results certainly prove the capabilities of these small organizations.